

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Amended) A networked electronic ordnance system, comprising:
a plurality of pyrotechnic devices connected by a network, each said pyrotechnic device comprising a logic device having a unique identifier; and
a bus controller connected to said plurality of pyrotechnic devices through said network, said bus controller being operative to selectively address, with a single command, one or more of said pyrotechnic devices using said unique identifiers, whereby a single command can be used to address as few as one and as many as all of the pyrotechnic devices that are connected to the network.
2. (Cancelled)
3. (Cancelled)
4. (Previously Amended) The networked electronic ordnance system of claim 1, wherein said bus controller transmits and receives multiplexed digital signals over said network.
5. (Original) The networked electronic ordnance system of claim 1, wherein at least one of said pyrotechnic devices further comprises an energy reserve capacitor electrically connected to said logic device.
6. (Original) The networked electronic ordnance system of claim 5, further comprising a bleed resistor electrically connected to said energy reserve capacitor.

7. (Original) The networked electronic ordnance system of claim 1, wherein each pyrotechnic device further comprises an initiator comprising:

a pyrotechnic assembly, and

an adjacent electronic assembly electrically connected to said logic device.

8. (Original) The networked electronic ordnance system of claim 7, wherein said electronic assembly comprises an energy reserve capacitor.

9. (Original) The networked electronic ordnance system of claim 8, further comprising a bleed resistor electrically connected to said energy reserve capacitor.

10. (Original) The networked electronic ordnance system of claim 1, wherein each pyrotechnic device comprises a bus interface electrically connected to said logic device.

11. (Original) The networked electronic ordnance system of claim 1, wherein said network is serial.

12. (Original) The networked electronic ordnance system of claim 1, wherein said network is parallel.

13. (Original) The networked electronic ordnance system of claim 1, wherein said network comprises at least one twisted shielded pair cable.

14. (Cancelled)

15. (Cancelled)

16. (Cancelled)

17. (Cancelled)

18. (Cancelled)

19. (Cancelled)

20. (Withdrawn) A method for operating a pyrotechnic device connected to a bus controller through a network, the pyrotechnic device having a logic device associated with a unique identifier, and an initiator, comprising:

transmitting a digital arming command from the bus controller to the pyrotechnic device, said digital arming command using the unique identifier of the logic device associated with the pyrotechnic device;

altering an analog condition of the network to a firing condition; and

transmitting a digital firing command from the bus controller to the armed pyrotechnic device.

21. (Cancelled)

22. (Withdrawn) The method of claim 20, wherein the digital firing command includes an address frame comprising the unique identifier of the logic device associated with the pyrotechnic device.

23. (Withdrawn) The method of claim 20, wherein the digital firing command comprises an all-fire signifier.

24. (Withdrawn) The method of claim 20, wherein said arming step further comprises storing activation energy in the pyrotechnic device in response to said digital arming command.

25. (Withdrawn) The method of claim 24, wherein said firing step further comprises releasing said activation energy into the initiator in response to said digital firing command.

26. (Withdrawn) The method of claim 20, further comprising:

transmitting a digital disarming command from the bus controller to the armed pyrotechnic device, said digital disarming command using the unique identifier of the logic device associated with the pyrotechnic device; and

dissipating said activation energy stored in the armed pyrotechnic device in response to said digital disarming command.

27. (Withdrawn) The method of claim 20, further comprising:

transmitting a digital test command from the bus controller to the pyrotechnic device, said digital test command using the unique identifier of the logic device associated with the pyrotechnic device; and

receiving a response to said digital test command from the pyrotechnic device.

28. (Withdrawn) A method for operating a pyrotechnic device having a logic device associated with a unique identifier, and an initiator, the pyrotechnic device connected to a bus controller through a network, comprising:

receiving a digital arming command from the bus controller, said digital arming command using the unique identifier of the logic device associated with the pyrotechnic device;

recognizing the unique identifier in the digital arming command;

arming the pyrotechnic device;

receiving a digital firing command having an address frame from the bus controller;

recognizing the contents of the address frame and the digital firing command;

checking an analog condition of the network; and

firing the pyrotechnic device if the analog condition of the network corresponds to an analog firing condition.

29. (Withdrawn) The method of claim 28, wherein said address frame comprises the unique identifier of the logic device associated with the pyrotechnic device.

30. (Withdrawn) The method of claim 28, wherein said address frame comprises an all-fire signifier.

31. (Previously Added) The networked electronic ordnance system of claim 1, wherein the bus controller is operative for assigning the unique identifiers to each of said logic devices.

32. (Previously Added) The networked electronic ordnance system of claim 31, wherein the bus controller is operative for assigning the unique identifiers to each of said logic devices each time the networked electronic ordnance system is powered up.

33. (Previously Added) A networked electronic ordnance system, comprising:

a plurality of pyrotechnic devices connected by a network, each pyrotechnic device comprising an initiator and a logic device associated with a unique identifier;

means for transmitting a digital arming command onto the network, the digital arming command using one or more of the unique identifiers;

means for altering an analog condition of the network to a firing condition; and

means for transmitting a digital firing command onto the network, the digital firing command using one or more of the unique identifiers; and

wherein the logic device in each of the pyrotechnic devices is operative for

storing activation energy in the associated pyrotechnic device if the digital arming command includes the unique identifier of the logic device; and

releasing the stored activation energy into the initiator of its associated pyrotechnic device if both (1) the analog condition of the network has been modified to the firing condition and (2) the digital firing command includes the unique identifier of the logic device.

34. (Previously Added) The networked electronic ordnance system of claim 33, wherein the means for altering the analog condition of the network alters one or more of the following network conditions: voltage level, frequency, or modulation depth.

35. (Amended) A networked electronic ordnance system, comprising:

a plurality of pyrotechnic devices, each pyrotechnic device comprising an energy reserve capacitor;

a network interconnecting the pyrotechnic devices for selectively distributing charging current to the energy reserve capacitors; and

wherein the amperage of the charging current and capacitance of the energy reserve capacitors are selected such that the capacitors are charged in approximately five milliseconds or less.

36. (Previously Added) The networked ordnance system as set forth in 35, wherein the current carried by the network is in the order of magnitude of milliamperes.

37. (Previously Added) The networked ordinance system as set forth in claim 35, wherein the energy reserve capacitors each have a capacitance on the order of two microfarads.

38. (Withdrawn) A pyrotechnic device adapted for use in a pyrotechnic system, comprising:

a logic device;

an initiator; and

a Faraday cage comprising a conductive shell around the logic device and the initiator to shield the same from the effects of external electric fields and static charges.

39. (Withdrawn) A method for testing an operating condition of a pyrotechnic device connected to a bus controller through a network, the pyrotechnic device having a logic device associated with a unique identifier, and an initiator having a firing element, comprising:

transmitting a digital test command from the bus controller and onto the network, the digital test command using the unique identifier of the logic device associated with the pyrotechnic device;

receiving the digital test command at the pyrotechnic device, recognizing the unique identifier and responsively testing the integrity of the firing element by passing a controlled current through the firing element and sensing the resistance to current flow through the firing element to determine the condition of the firing element;

transmitting the results of the firing element test from the pyrotechnic device to the bus controller.

40. (Withdrawn) The method of claim 39, further comprising transmitting the test results of the firing element test from the bus controller to a central vehicle processor.

41. (Withdrawn) A method for selectively testing an operating condition of one or more of a plurality of pyrotechnic devices connected to a bus controller through a network, each pyrotechnic device having a logic device associated with a unique identifier, comprising:

transmitting a test signal from the bus controller and onto the network, the test signal using one or more of the unique identifiers;

selectively testing an operating condition of one or more pyrotechnic devices in response to the test signal; and

transmitting the results of the tests from the pyrotechnic devices and onto the network.

42. (Withdrawn) The method of claim 41, wherein each of the pyrotechnic devices comprises a firing element and the testing comprises passing a controlled current through the firing element and sensing the resistance to current flow through the firing element to determine the condition of the firing element.

43. (Withdrawn) The method of claim 41, further comprising receiving the test results at the bus controller.

44. (Withdrawn) The method of claim 43, further comprising transmitting the test results from the bus controller to a central vehicle processor.

45. (Withdrawn) A method for testing an electronic ordnance system comprising a bus controller connected to a plurality of pyrotechnic devices by a network, the method comprising:

transmitting a test signal over the network from the bus controller to one or more of the pyrotechnic devices;

receiving the test signal at said one or more of the pyrotechnic devices and transmitting a response signal from each of said one or more of the pyrotechnic devices; and

receiving the response signal(s) at the bus controller and comparing the response signal(s) to a predetermined condition to determine the status of the network.

46. (Withdrawn) A method for testing an electronic ordnance system comprising a bus controller connected to a plurality of pyrotechnic devices by a network, the method comprising:

determining an operating status of the network by sensing one or more of the following conditions: a current drawn by the bus controller or a voltage of the bus controller.

47. (Withdrawn) An assembly for use in a pyrotechnic system, comprising:

a substrate; and

a plurality of pyrotechnic devices, each pyrotechnic device comprising a logic device mounted on the substrate and an initiator mounted on the substrate.

48. (Withdrawn) The assembly of claim 47, wherein the logic device and the initiator of a given pyrotechnic device are interconnected by circuit traces on the substrate.

49. (Withdrawn) A method for operating a networked electronic ordnance system comprising a plurality of pyrotechnic devices and a bus controller connected by a

network, each pyrotechnic device comprising a logic device having a unique identifier, the method comprising:

operating the bus controller to selectively address, with a single command, one or more of the pyrotechnic devices using the unique identifiers.

50. (Withdrawn) The method of claim 49, further comprising:

transmitting a digital arming command from the bus controller and onto the network, the digital arming command using one or more of the unique identifiers; and

storing an activation energy in one or more of the pyrotechnic devices in response to the digital arming signal.

51. (Withdrawn) The method of 50, further comprising:

altering an analog condition of the network to a firing condition;

transmitting a digital firing command from the bus controller and onto the network, the digital firing command using one or more of the unique identifiers; and

firing one or more of the pyrotechnic devices in response to the digital firing command and the analog condition of the network corresponding to the firing condition.

52. (Withdrawn) The method of claim 49, further comprising:

transmitting a test signal from the bus controller and onto the network, the test signal using one or more of the unique identifiers; and

testing an operating condition of one or more pyrotechnic devices in response to the test signal.

53. (Withdrawn) The method of claim 52, further comprising transmitting the results of the tests from the pyrotechnic devices to the bus controller.

54. (Withdrawn) A pyrotechnic device adapted for use in a pyrotechnic system, comprising:

a substrate;

a logic device mounted on the substrate; and

an initiator mounted on the substrate.

55. (Withdrawn) The pyrotechnic device of claim 54, wherein the logic device and the initiator are interconnected by circuit traces on the substrate.

56. (Withdrawn) The pyrotechnic device of claim 54, further comprising an energy reserve capacitor electrically connected to the logic device.

57. (Withdrawn) The pyrotechnic device of claim 54, further comprising a bleed resistor electrically connected to the energy reserve capacitor.

58. (Withdrawn) The pyrotechnic device of claim 54, wherein the initiator comprises:

a pyrotechnic assembly, and

an electronic assembly connected to the logic device.

59. (Withdrawn) The pyrotechnic device of claim 58, wherein the electronic assembly comprises an energy reserve capacitor.

60. (Withdrawn) The pyrotechnic device of claim 59, further comprising a bleed resistor connected to the energy reserve capacitor.

61. (Withdrawn) The pyrotechnic device of claim 54, further comprising a bus interface connected to the logic device.

62. (Previously Added) A networked electronic ordnance system, comprising:

a plurality of pyrotechnic devices connected by a network, each pyrotechnic device comprising a logic device having a unique identifier; and

a bus controller connected to the plurality of pyrotechnic devices through the network, the bus controller being operative for assigning the unique identifiers to the logic devices.

63. (Previously Added) The networked electronic ordnance system of claim 62, wherein the bus controller is operative for assigning the unique identifiers to the logic devices each time the networked electronic ordnance system is powered up.

64. (Previously Amended) A networked electronic ordnance system, comprising:
a plurality of pyrotechnic devices connected by a network, each pyrotechnic device comprising a logic device having a unique identifier;

a bus controller connected to said plurality of pyrotechnic devices through said network, said bus controller being operative to selectively address, with a single command, one or more of said pyrotechnic devices using said unique identifiers, whereby a single command can be used to address as few as one and as many as all of the pyrotechnic devices that are connected to the network; and

wherein one or more of said pyrotechnic devices comprise non-detonating initiators.

65. (Previously Added) The networked electronic ordnance device of claim 64, wherein the non-detonating initiators comprise a cable cutter or a bolt cutter.

66. (Newly Added) A networked electronic ordnance system, comprising:

a plurality of pyrotechnic devices connected by a network, each pyrotechnic device comprising an initiator and a logic device associated with a unique identifier;

a bus controller connected to said plurality of pyrotechnic devices through said network, said bus controller being operative to (1) transmit a digital arming command onto the network, the digital arming command using one or more of the unique identifiers (2) alter an analog condition of the network to a firing condition; and (3) transmit a digital firing command onto the network, the digital firing command using one or more of the unique identifiers; and

wherein the logic device in each of the pyrotechnic devices is operative for

storing activation energy in the associated pyrotechnic device if the digital arming command includes the unique identifier of the logic device; and

releasing the stored activation energy into the initiator of its associated pyrotechnic device if both (1) the analog condition of the network has been modified to the firing condition and (2) the digital firing command includes the unique identifier of the logic device.

67. (Newly Added) The networked electronic ordnance system of claim 66, wherein the means for altering the analog condition of the network alters one or more of the following network conditions: voltage level, frequency, or modulation depth.